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GB 1073122
GB 676858
GB 675590
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US 3901161A
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(54) Freight car truck assembly

(57) In a three-piece truck, the friction wedges 52 (which damp the movements of the bolster 40 with respect to the side frames 44) are a close sliding fit in their pockets 42 (Figure 19). The warp stiffness of the truck - and hence the onset of hunting - is therefore increased.

In addition, the sloping sections of the bolster pocket may merge along their length to form a curvilinear crown 72 (Figure 24) which is in line contact with the bevelled surfaces 62 of the wedges 52a, b so that if the bolster tilts the wedges can rock to maintain full face contact with the side frames.

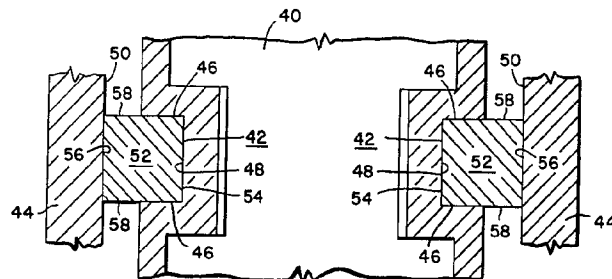


FIG. 19.

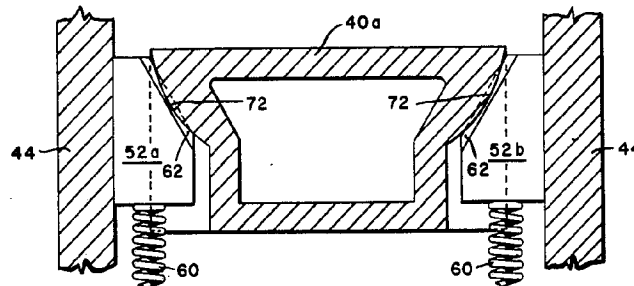


FIG. 24.

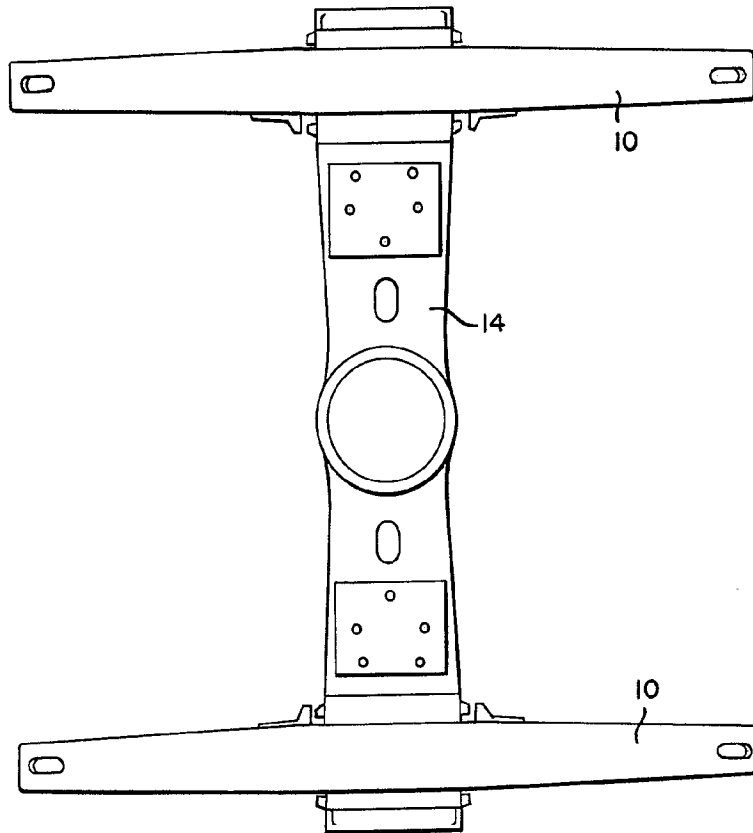


FIG. 1.

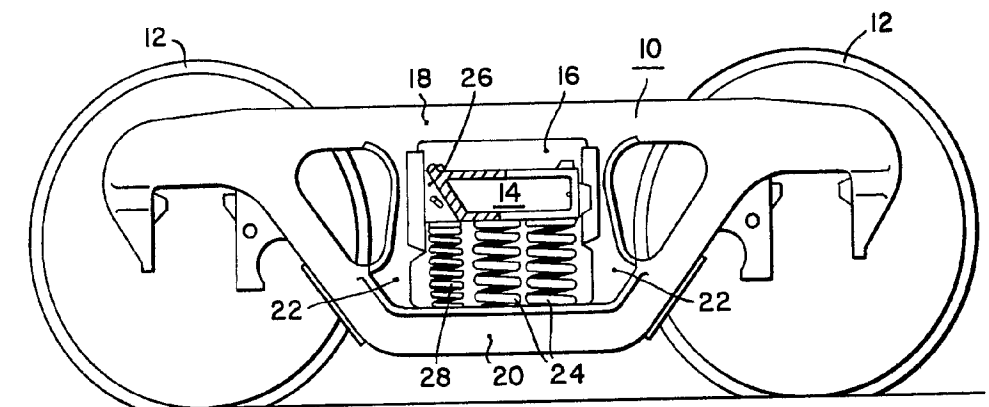
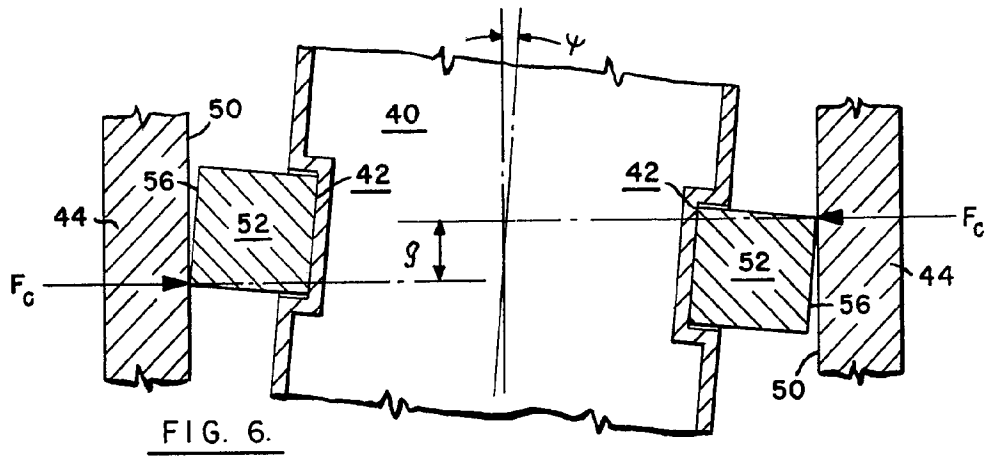
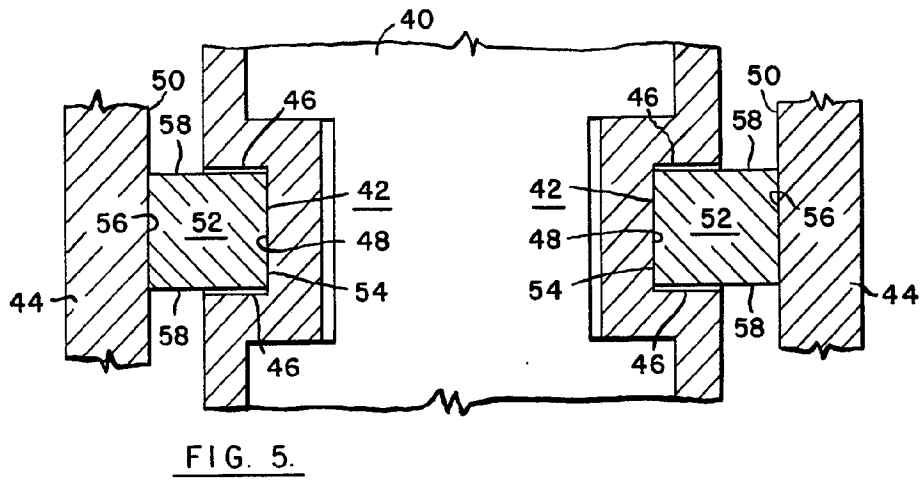
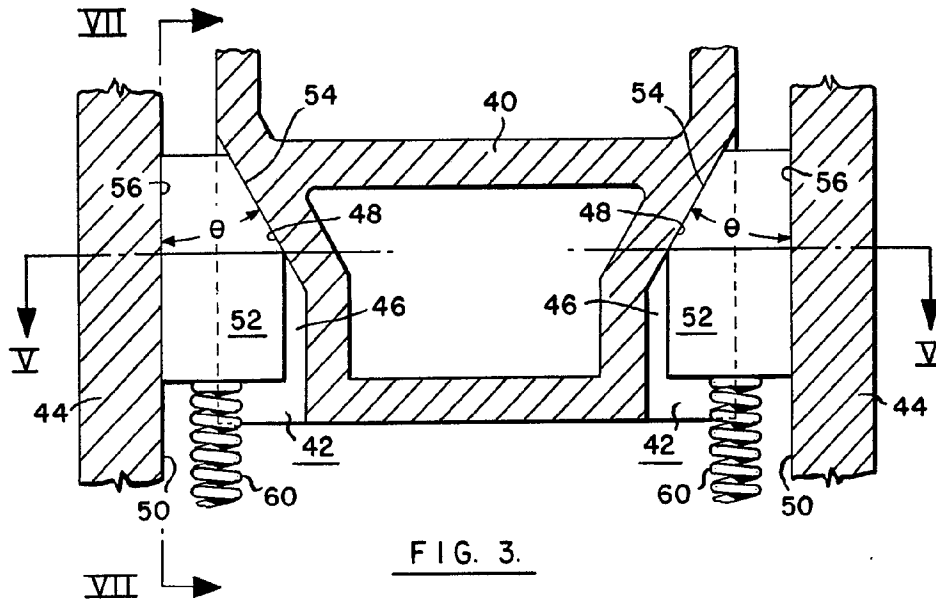


FIG. 2.



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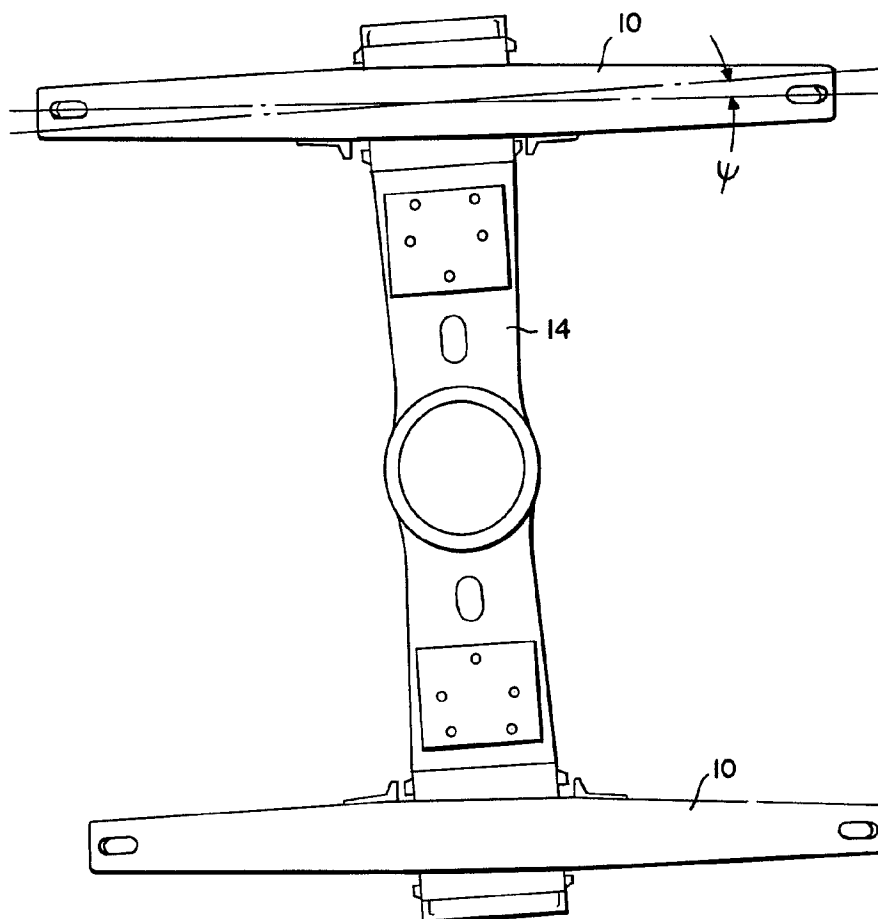


FIG. 4.

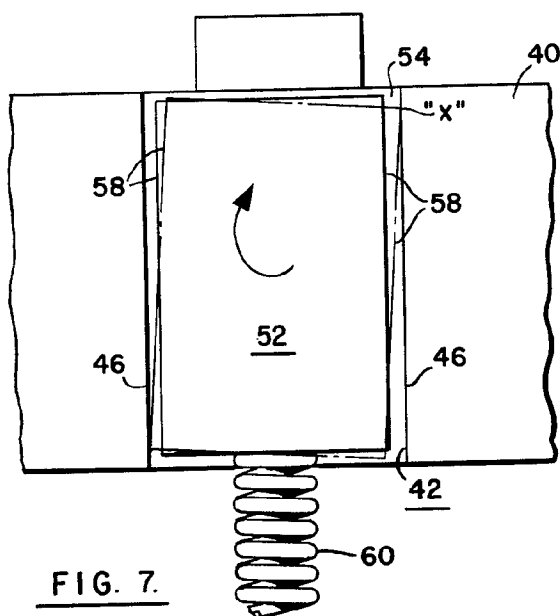


FIG. 7.

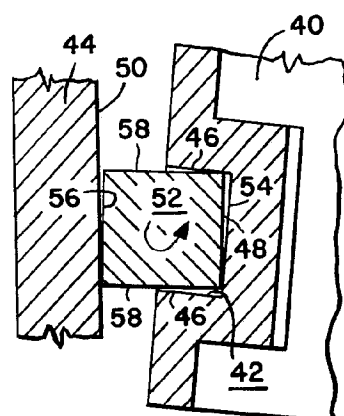


FIG. 8.

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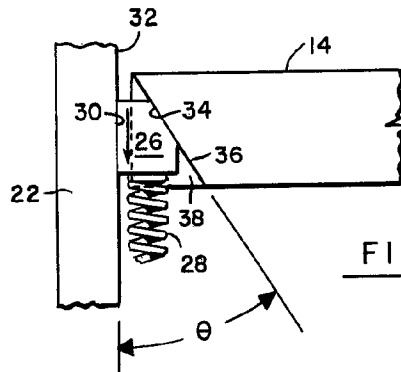


FIG. 9.

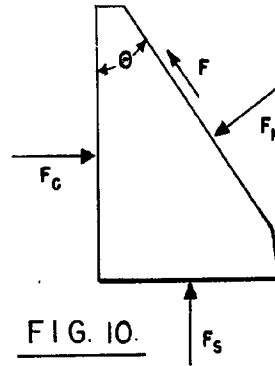
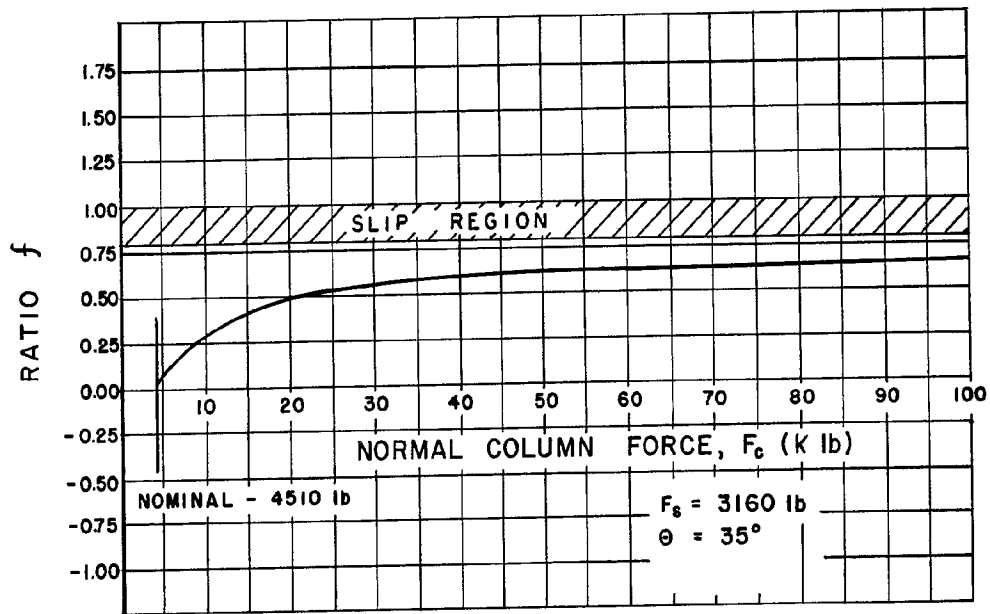


FIG. 10.



NO VERTICAL MOTION

FIG. II.

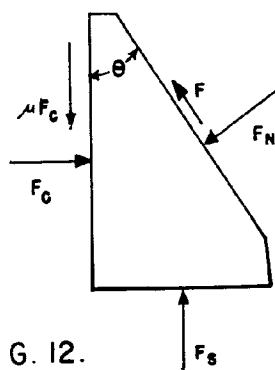


FIG. 12.

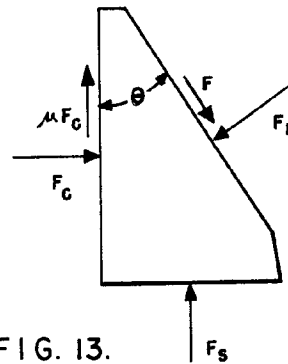
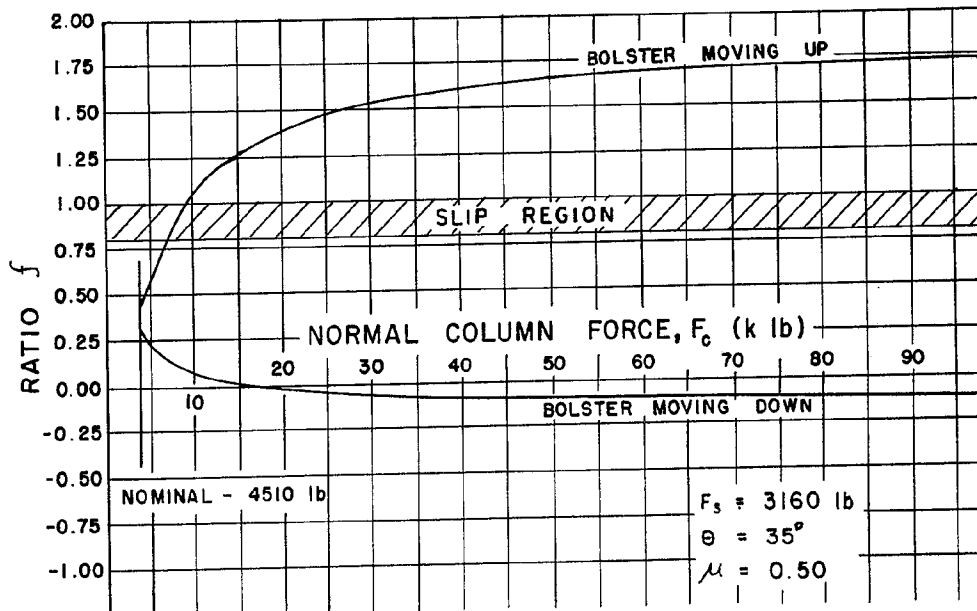


FIG. 13.

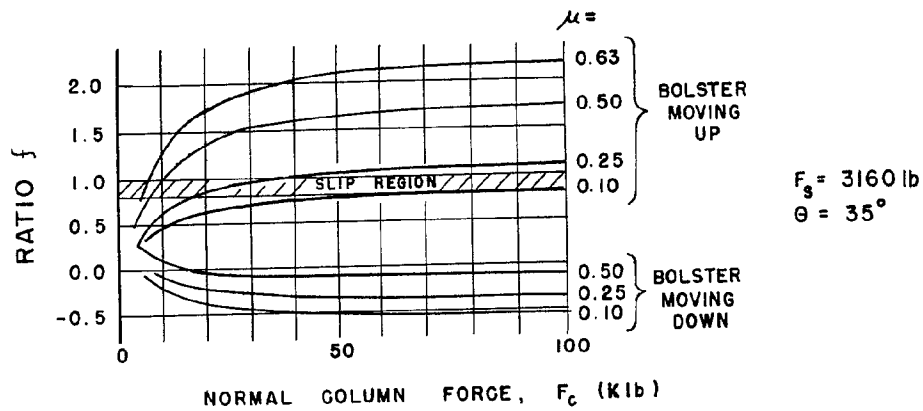
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WITH VERTICAL MOTION

FIG. 14.



VARY COEFFICIENT OF FRICTION, μ

FIG. 15.

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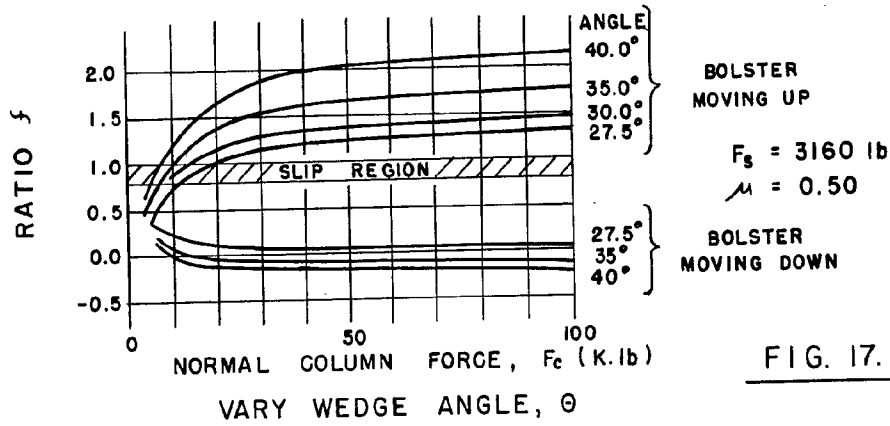


FIG. 17.

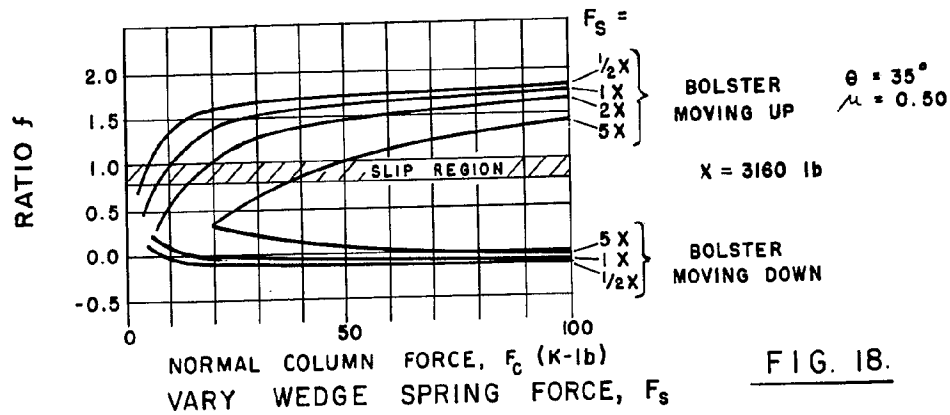


FIG. 18.

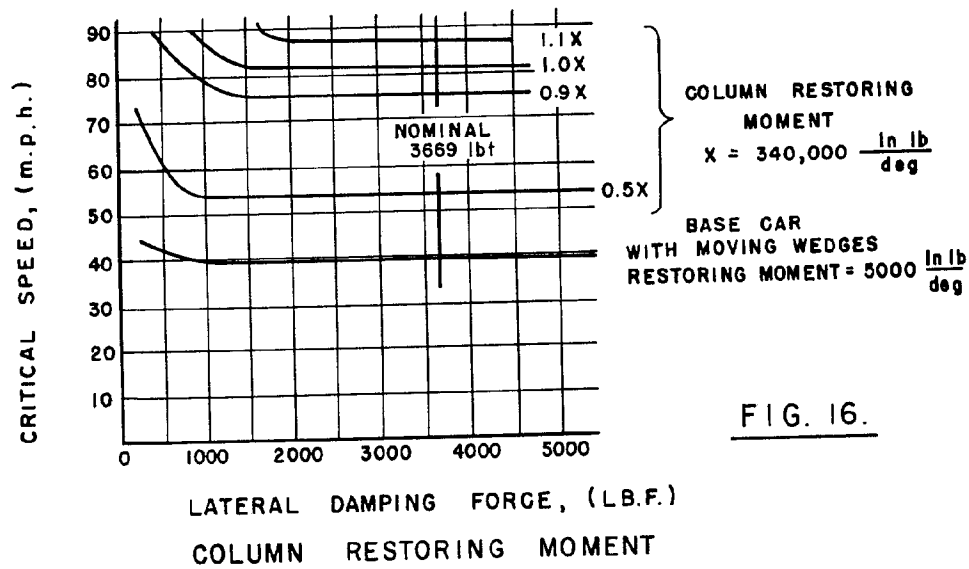


FIG. 16.

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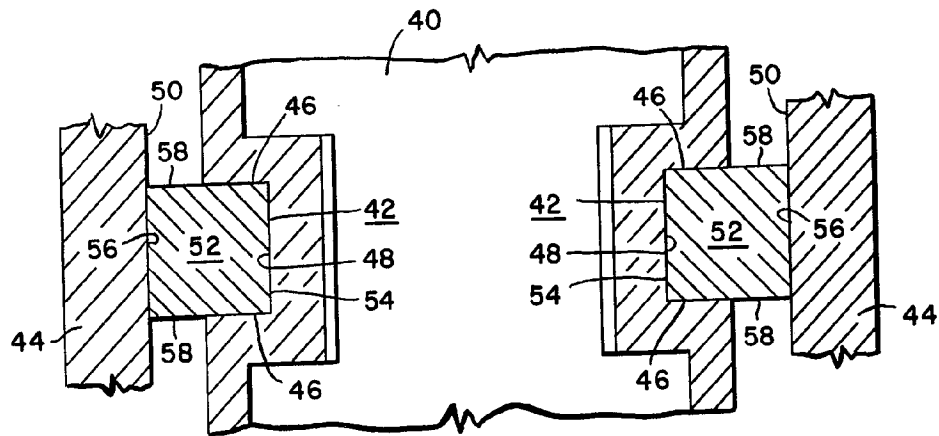


FIG. 19.

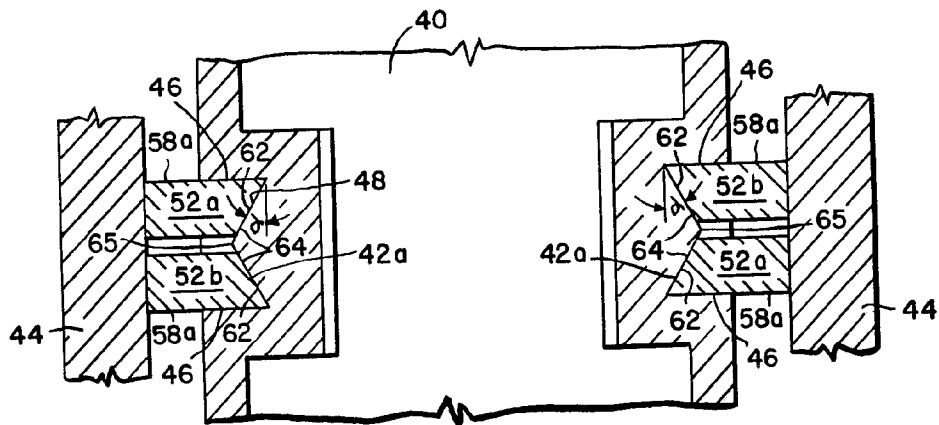


FIG. 20.

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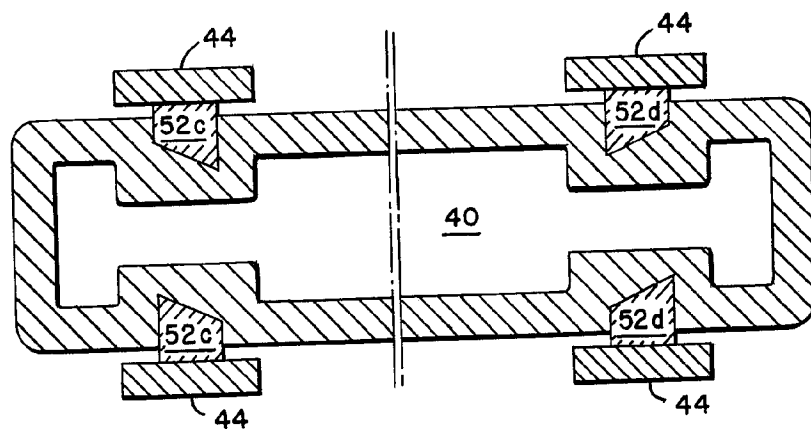


FIG. 21.

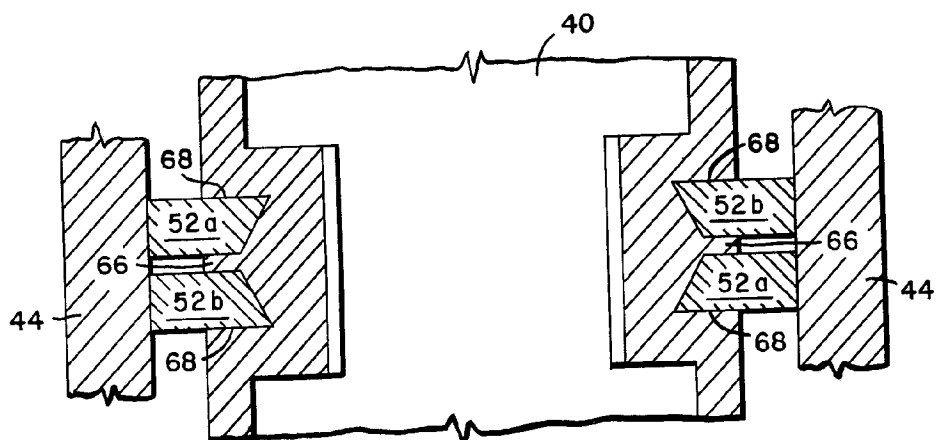


FIG. 22.

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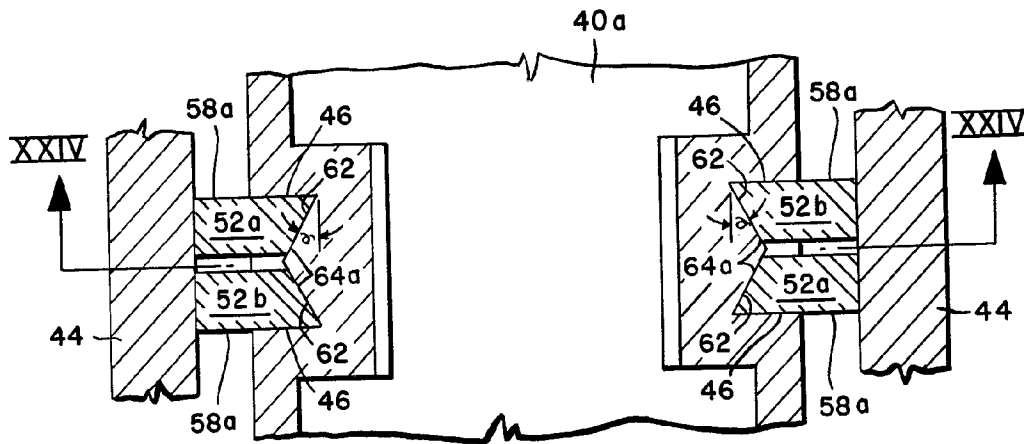


FIG. 23.

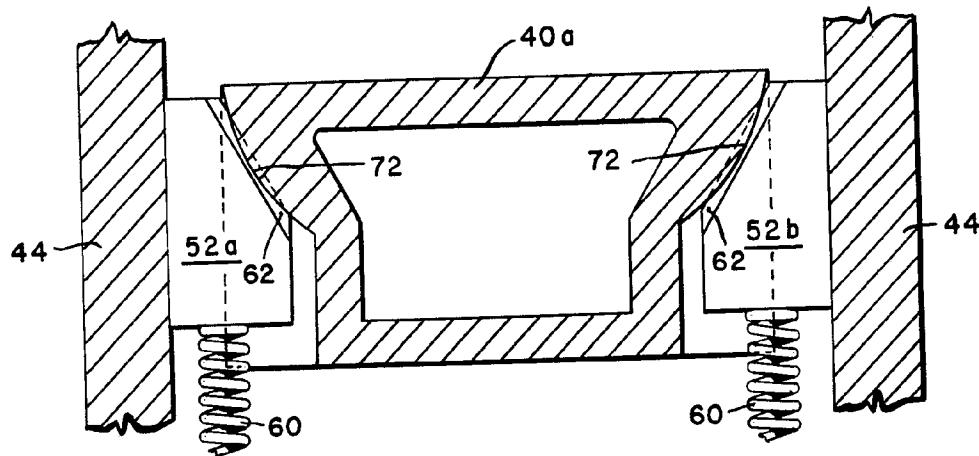


FIG. 24.

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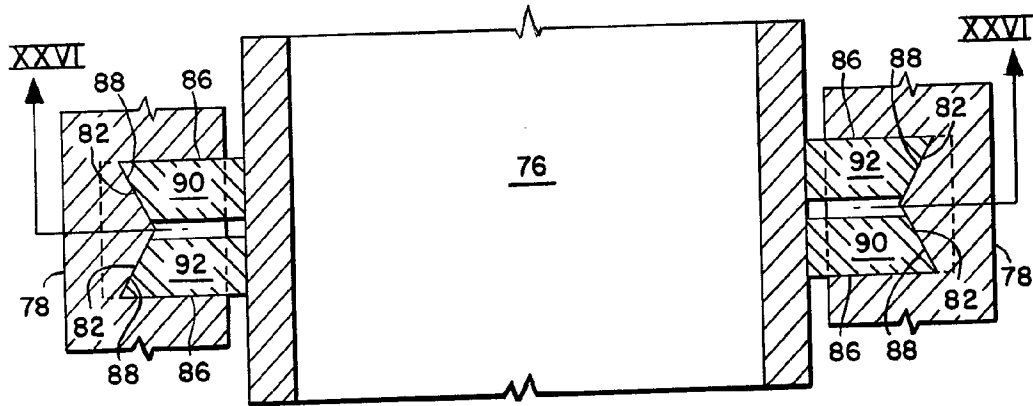


FIG. 25.

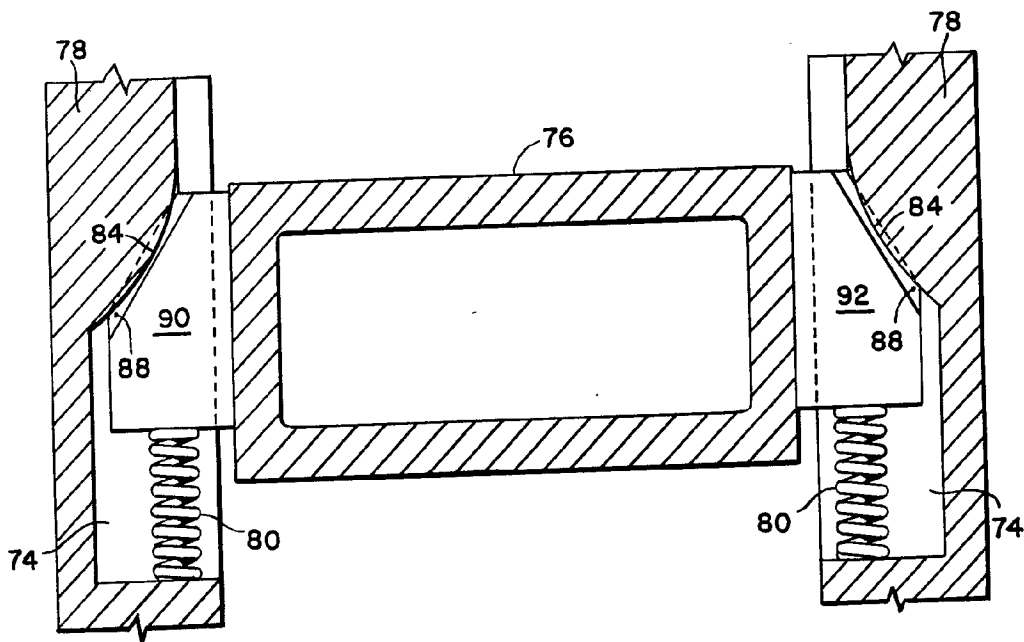


FIG. 26.

SPECIFICATION

Freight car truck assembly

- 5 The present invention relates to improvements in three-piece freight car truck assemblies.

In a three-piece truck assembly, the side frames and bolster normally are square, i.e., the wheelsets and bolster (parallel to one another) are disposed normal to the side frames. Occasionally, however, at 10 certain car speeds, the truck may become dynamically unstable, a phenomenon known as truck hunting, manifested by the truck going out of square or warping. The prior art teaches several ways of preventing truck hunting, e.g., the use of resilient sides bearings, increasing warp stiffness, steering the wheelsets, the use of conical wheel profiles, reducing lateral resistance, etc., and the literature has reported certain levels of warp stiffness 15 achieved by three-piece truck assemblies. But numerous tests run to confirm the reported data show that warp stiffness of the levels reported by the literature be achieved with known designs of three-piece freight car truck assemblies, and it appears 20 that the reason for the lack of warp stiffness is instability of the wedges within the pockets.

It has now been found that a novel wedge system is capable of achieving a warp stiffness high enough to elevate the critical speed of truck hunting (the 30 speed at which hunting will first occur) to a level suitable for freight car operation. The system requires very little change from, and is competitive with, conventional designs.

According to the present invention there is provided in a freight car truck assembly,

(A) a pair of laterally spaced wheeled side frame members each having a bolster opening defined by means including a pair of laterally spaced column members with opposed friction surfaces defining the 40 width of said opening;

(B) a bolster member spanning said side frame members and having opposite end portions respectively projecting into said bolster openings, the opposite side surface areas of each bolster end portion respectively opposed to said friction surfaces being disposed respectively in close spaced relation thereto; and

(C) mounting means for mounting said bolster member upon said side frame members comprising:

(i) support means interposed between said bolster and side frame members, operative for yieldably supporting said bolster means on said side frame members,

(ii) a system of wedge members interposed 55 between said bolster and column members, each of said wedges being disposed in a pocket formed in one of said bolster and column members with oppositely facing sides thereof respectively in close, sliding engagement with opposed sides of the 60 pocket, and

(iii) yieldable means urging each of said wedge members into an effective working position wherein the sloping and friction surfaces of the wedge member are in sliding engagement respectively with 65 the sloping surface of the pocket formed in one said

bolster and column members and with the other of said members.

The present invention will now be illustrated with reference to the accompanying drawings in which:-

70 *Figure 1* is a plan view showing the side frames and bolster of a typical three-piece freight car truck assembly;

Figure 2 is an elevation looking at a side frame of the truck assembly, part being broken away to 75 expose others;

Figure 3 is a fragmentary vertical section through one end of bolster showing a conventional wedge system;

Figure 4 is similar to *Figure 1*, but illustrates 80 orientation of the side frames and bolster during truck hunting;

Figure 5 is a section on lines V-V in *Figure 3*;

Figure 6 is similar to *Figure 5*, but shows the bolster angled relative to the side frame, as when the 85 assembly is warped;

Figure 7 is a section on lines VII-VII in *Figure 3*, diagrammatically illustrating horizontal rotation of the wedge;

Figure 8 diagrammatically shows the bolster 90 angled relative to the side frame with the wedge unsecured, and illustrating vertical rotation of the wedge;

Figure 9 is a diagrammatic showing of a conventional wedge system;

95 *Figure 10* is a free body diagram of a friction wedge showing the forces acting upon the wedge under static conditions;

Figure 11 is a diagram showing the ratio f plotted against the normal column force F_c for the static 100 condition;

Figure 12 is a free body diagram of a friction wedge showing the forces acting upon the wedge when the bolster moves upwardly;

Figure 13 is a free body diagram of a friction 105 wedge showing the forces acting upon the wedge when the bolster moves downwardly;

Figure 14 is a diagram showing the ratio f plotted against normal column force F_c for movement of the bolster upwardly and downwardly;

110 *Figure 15* is a diagram showing the ratio f plotted against normal column force F_c for varying values of the coefficient of friction μ ;

Figure 16 is a diagram showing critical speed plotted against lateral damping force for varying 115 values of column restoring moment;

Figure 17 is a diagram showing the ratio f plotted against normal column force F_c for varying values of wedge angles θ ;

120 *Figure 18* is a diagram showing the ratio f plotted against normal column force F_c for varying values of wedge spring force F_s ;

Figure 19 is similar to *Figure 5*, but shows a wedge system embodying the invention;

125 *Figure 20* is similar to *Figure 19*, but shows a modified wedge system embodying the invention;

Figure 21 is a diagrammatic showing of another wedge system embodying the invention;

130 *Figure 22* is similar to *Figure 20*, but shows still another modified wedge system embodying the invention;

Figure 23 is similar to Figure 20, but shows the preferred embodiment of the invention;

Figure 24 is a fragmentary vertical section on lines XXIV-XXIV in Figure 23;

- 5 Figure 25 shows an alternative arrangement of the embodiment of the invention shown in Figure 23; and

Figure 26 is a fragmentary vertical section on lines XXVI-XXVI in Figure 25.

- 10 Referring particularly to Figures 1 and 2, a typical freight car truck assembly may comprise a pair of laterally spaced side frames 10 carried by a pair of wheelsets 12 and spanned by a bolster 14. Each side frame is provided with an opening 16 defined by a
- 15 compression member 18, a tension member 20, and a pair of side frame columns 22. The opposite end portions of the bolster 14 extend respectively through the openings 16 and are carried respectively through the openings 16 and are carried respectively
- 20 by spring groups 24 acting against side frame spring seats. In the arrangement shown particularly in Figure 2, a friction wedge, generally designated 26, is carried by a spring 28 acting against the side frame spring seat to urge the wedge upwardly between the
- 25 bolster and the side frame column. As the bolster moves vertically, the friction wedges slide against the side frame columns to generate damping forces. Since the spring force loading a friction wedge is a function of the spring group travel or vertical motion
- 30 of the bolster, the spring force is greater when the car is loaded than when the car is empty. Thus, the damping force varies with the car weight. In another arrangement, not shown, instead of the wedge spring acting against the side frame spring seat, it is
- 35 carried by the bolster, as a consequence of which the damping force is constant regardless of the car weight. The usual form of the friction wedges is illustrated diagrammatically in Figure 3. The wedge 52 has a column or friction surface 56 which
- 40 frictionally engages the opposed surface 50 of the side frame column 44. In addition, it has a surface 48 sloping at an angle θ (in the order of 35 degrees relative to the column surface 56), which surface 48 frictionally engages the opposed sloping surface 54
- 45 of a pocket 42 formed in the bolster 40. The pocket 42 accommodates the wedge 52, which is urged upwardly between the side frame column and the bolster by the wedge spring 60, as shown. The primary motion during truck hunting is shown in Figure 4. The side
- 50 frames 10 remain parallel with each other while forming the warp angle Ψ with the bolster 14. Now referring particularly to Figures 3 and 5, open pockets 42 are formed at each end of the bolster 40 respectively opposite the columns 44 of the associated side frame. The opening into each pocket faces the adjacent side frame column. The pocket is provided with parallel opposed sides 46, and the opposite sides 58 of the wedge 52 are parallel thereto. In the square condition of the assembly the
- 60 column surfaces of the wedges are in full face engagement with the faces of the side frame columns, and the sloping surfaces respectively of the bolster pockets and the wedges are in full face engagement. When the assembly warps, the bolster
- 65 assumes a position such as that shown in Figure 6.

This results in a binding between the corners of the wedges 52 and the faces 50 of the side frame columns. The resulting forces F_c , spaced at distance g , product a restoring moment of gF_c . This moment increases as the angle Ψ increases, providing the wedges 52 remain secure in the bolster pockets 42. But certain movements of the wedges 52 within the bolster pockets 42 prevent the warp moment gF_c from becoming high enough to preclude truck hunting. These movements may be designated: (1) Horizontal Rotation of the Wedges (Figure 7); (2) Vertical Rotation of the Wedges (Figure 8); and (3) Unloading of the Wedges (Figure 9). In Figure 16 critical speeds for a 70-ton hopper car are plotted against lateral damping forces for varying values of column restoring moment or warp stiffness. The advantageous effect of high column restoring moment or high warp resistance is apparent. The higher the warp resistance, the higher the critical speed of hunting.

The first undesirable movement is rotation of the wedge 52 in the bolster pocket 42 about a horizontal axis, see Figure 7. The wedge 52 rotates in the direction shown and slips downwardly slightly in the bolster pocket 42. This permits the corner of the wedge designated "x" to move deeper into the bolster pocket, as a consequence of which the force F_c is reduced, which in turn reduces the warp moment, gF_c , and lowers the critical speed of truck hunting. The second undesirable movement is rotation of the wedge 52 in the bolster pocket 42 about a vertical axis, see Figure 8. The wedge 52 rotates in the direction shown. This motion frees the static friction between the bolster sloping surface 54 and the wedge 52, as a consequence of which the force F_c is reduced, which also reduces the warp moment gF_c . Finally, as shown in Figure 9, under certain conditions the wedge 26 may move downwardly, in the direction of the arrow, in the bolster pocket 38. Due to sloping surface 34 of the wedge 26, the wedge 26 may draw back from the side frame column 22, resulting in a rapid decrease in F_c , which again reduces the warp moment, gF_c .

The next sequence of figures describes the unloading of the wedges. Figures 10, 12 and 13 are diagrams of a wedge showing the forces acting upon the wedge when there is no vertical motion of the bolster and when there is such motion. With regard to the static condition (Figure 10), it may be shown that

$$F_N = F_c \cos \theta + F_s \sin \theta$$

$$F = F_c \sin \theta - F_s \cos \theta,$$

where F_N is the force normal to the sloping surface of the wedge, F the corresponding in-plane friction force, F_c the force normal to the column surface of the wedge, and F_s the wedge spring force. In Figure 11, the ratio $f = F/F_N$, a measure of the static coefficient of friction, is plotted against normal column force F_c , and it will be noted that the curve levels off at a value below the static coefficient of friction, which may range between 0.80 and 1.0 for cast steel in static bearing. If the ratio f exceeds the static coefficient of friction, the wedge will slip relative to the bolster pocket and the column force F_c will be reduced considerably.

With regard to upward movement of the bolster (Figure 12), it may be shown that

$$F_N = F_c (\cos \theta - \mu \sin \theta) + F_s \sin \theta \quad (a)$$

$$F = F_c (\sin \theta + \mu \cos \theta) - F_s \cos \theta \quad (b)$$

5

and with regard to downward movement of the bolster (Figure 13), it may be shown that

$$F_N = F_c (\cos \theta + \mu \sin \theta) + F_s \sin \theta \quad (c)$$

$$10 \quad F = F_c (-\sin \theta + \mu \cos \theta) + F_s \cos \theta \quad (d)$$

To find the ratio $f = F/F_N$ the pairs of equations (a) and (b), and (c) and (d) may be used for both upward and downward movement of the bolster, respectively.

15 Figure 14 shows the ratio f plotted against normal column force F_c for loaded car ($F_s = 3160$ lbs.) bolster movement in both directions. The slip region is defined as the region where the static coefficient of friction between the sloping wedge surface the the truck bolster pocket is in the range between 0.80m and 1.0. When the ratio f is equal to or above this range the wedges will slip. If the wedges slip, warp stiffness is reduced substantially because the tight connection between the side frame columns and the

25 bolster is lost. In Figure 14, the system enters the slip region when F_c approaches 8,000 lbs. for upward motion of the bolster. The ratio f is well behaved for downward motion, ranging between +0.30 and -0.13.

30 A parametric study made to assess the effect of the variables in equations (a), (b), (c) and (d) has led to the following conclusions:

(1) With regard to the coefficient of sliding friction μ : Referring to Figure 15, although raising the value 35 from 0.50 to 0.63 increases the ratio f for upward motion, the point where the slip region is entered does not change appreciably. By lowering the value to 0.10 the slip region is almost avoided. However, this is a marginal level for practical application, i.e., it does not provide a comfortable margin below the slip region. In the case of downward motion, lowering the value causes higher values of negative ratio f . If these reach the region between -0.8 and -1.0, the wedge may slip downward relative to the bolster.

45 (2) With regard to wedge angle θ : Referring to Figure 17, decreasing the wedge angle lowers the ratio f for upward motion, but it does not have an appreciable effect upon entry into the slip region. The ratio f for downward movement of the bolster is well behaved.

(3) With regard to loaded car wedge spring force F_s : Referring to Figure 18, for upward motion of the bolster increasing the wedge spring force lowers the maximum ratio f and changes entry into the slip 55 region considerably. For downward motion, the system is well behaved.

As a result of the parametric study it was concluded that merely varying a single parameter probably would not result in a practical system to 60 secure the wedges against undesirable unloading during vertical motion, and that to achieve one purpose of this invention it probably would be necessary to vary one or more of the parameters studied. The study suggested reducing the wedge 65 angle θ from 35 to 30 degrees, reducing the column

coefficient of friction from 0.50 to the range of 0.25 to 0.30, and increasing the empty and loaded wedge spring force substantially.

Horizontal and vertical rotation of the wedge 52 70 within the pocket 42 of the bolster 40 may be reduced by making tight the fit of the wedge within the bolster pocket, as shown in Figure 19. This increases the warp stiffness significantly. The clearance between the sides 46 of the bolster pocket 42 and the opposed sides 58 of the wedge 52 was reduced to a minimum for a road test. With the wedge thus secured, testing indicated that the on-set of truck hunting was increased significantly.

Alternatively, the bottom of the bolster pocket, in addition to sloping as shown in Figure 3, may be made to slope from each sidewall 46 of the bolster pocket toward the centre of the pocket and toward the opening into the pocket, as shown in Figure 20. The sloping sections 64 of the bolster pocket are flat 85 across the width thereof and merge along the length thereof to form a rectilinear crown 65 disposed midway between the opposed sidewalls of the bolster pocket. The wedge may be in two separate sections 52a and 52b disposed side-by-side in the 90 pocket 42a in slightly spaced relation to one another. The sloping surfaces of the wedge sections are bevelled, and the bevelled surfaces, designated 62, are disposed in full face engagement with the opposed sloping sections 64 of the pocket, while the 95 remote sides of the wedge sections, designated 58a, are in full face engagement respectively with the opposed sides 46 of the pocket. This permits the wedge spring 60 to urge both sections of the wedge against the side frame column 44 by the reaction of 100 angle θ , Figure 3. Simultaneously, the wedge sections are separately urged respectively against the bolster pocket sidewalls 46 by the angles α . Being forced into this position by the combined angles α and the θ the wedges cannot rotate about either the 105 vertical or horizontal axis.

Another alternative embodiment is indicated diagrammatically in Figure 21. The construction is similar to that shown in Figure 19, except that the sloping surfaces of the bolster pocket and the wedge 110 are compound slopes, as indicated in connection with Figure 20. The wedges at each end of the bolster are fabricated to the same hand, while the wedges on each side of the bolster are fabricated to the right and left hands.

115 Still another alternative embodiment is indicated in Figure 22. The construction is similar to that shown in Figure 20, except that the pocket 42a shown in Figure 20 is partitioned by a vertically extending wall 66 into two separate sections 68 for 120 respectively accommodating the sections of the wedges 52a and 52b.

The preferred embodiment, diagrammatically indicated in Figures 23 and 24, is very similar to that shown in Figure 20. The sloping sections 64a of the 125 bolster pocket are flat across the width thereof. However, they merge along the length thereof to form a curvilinear crown 72 disposed midway between the opposed sidewalls of the bolster pocket. As a consequence, the sloping sections 64a present 130 a convex surface, as viewed looking into the pocket,

and the bevelled surfaces 62 of the wedges 52a and 52b are disposed in line contact therewith. Thus, when the bolster tilts to one side, the wedge members rock over the convex surfaces to maintain full face contact between the wedge members and the columns of the side frame members.

The embodiment of the invention diagrammatically shown in Figures 25 and 26 is basically similar to that shown in Figures 23 and 24. However, the wedge accomodating pockets 74 are not formed in the bolster 76. Instead, they are formed in the columns 78 of the side frame members. In addition, the wedge springs 80 are housed in the pockets 74. The sloping sections 82 of the pocket 74 are flat across the width thereof and merge along the length thereof to form the curvilinear crown 84 disposed midway between the opposed sidewalls 86 of the pocket 74. As a consequence, the sloping sections 82 present a convex surface, as viewed looking into the pocket, and the bevelled surfaces 88 of the wedges 90 and 92 are disposed in line contact therewith. Thus, when the bolster 76 tilts to one side, the wedge members 90 and 92 rock over the convex surfaces as required to maintain full face contact between the wedge members and the sides of the bolster.

An embodiment of the invention entails one or more of the following:

- (1) Reduced wedge angle θ .
- (2) Reduced coefficient of friction μ .
- (3) Increased snubber spring force F_s .
- (4) Wedge and bolster pocket arranged to preclude horizontal and vertical wedge rotation.

CLAIMS

1. In a freight car truck assembly,
 - (A) a pair of laterally spaced wheeled side frame members each having a bolster opening defined by means including a pair of laterally spaced column members with opposed friction surfaces defining the width of said opening;
 - (B) a bolster member spanning said side frame members and having opposite end portions respectively projecting into said bolster openings, the opposite side surface areas of each bolster end portion respectively opposed to said friction surfaces being disposed respectively in close spaced relation thereto; and
 - (C) mounting means for mounting said bolster member upon said side frame members comprising:
 - (i) support means interposed between said bolster and side frame members, operative for yieldably supporting said bolster means on said side frame members,
 - (ii) a system of wedge members interposed between said bolster and column members, each of said wedges being disposed in a pocket formed in one of said bolster and column members with oppositely facing sides thereof respectively in close, sliding engagement with opposed sides of the pocket, and
 - (iii) yieldable means urging each of said wedge members into an effective working position wherein the sloping and friction surfaces of the wedge member are in sliding engagement respectively with

the sloping surface of the pocket formed in one of said bolster and column members and with the other of said members.

2. An assembly according to Claim 1, wherein the wedge accomodating pockets are formed in the bolster member, and the wedge members are secured respectively in said pockets for turning movement with said bolster member, without lost motion, when the bolster member turns relative to the side frame members under the influence of a warp inducing effort applied to said assembly.

3. An assembly according to Claim 2, wherein the wedge members are secured in said pockets against turning therein about a vertical axis and about a selected horizontal axis, each axis being normal to said bolster member.

4. An assembly according to Claim 3, wherein each wedge is a one-piece member, and the interface between opposed sloping surfaces respectively of the wedge member and bolster pocket is flat across the full width of said wedge member and bolster pocket.

5. An assembly according to Claim 4, wherein the sloping surface of the bolster pocket extends deeper into said pocket on one side thereof than on the other thereby forming a groove which is V-shaped in transverse section, one side of said groove being a side of said pocket and the other being the sloping surface of said pocket, and the wedge member is provided with a sloping surface bevelled for slidably fitting into said groove.

6. An assembly according to Claim 5, wherein the bevelled surfaces of the wedge members at each end of the bolster member slope in the same direction, and the bevelled surfaces of the wedge members on a first side of the bolster member diverge toward the other side, while the bevelled surfaces of the wedge members on said other side converge toward said first side.

7. An assembly according to any of Claims 3 to 6, wherein the sloping surface of the bolster pocket is deeper at the opposed sidewalls of the pocket than at the centre thereof whereby the sections of said surface respectively adjacent said opposed sidewalls have a compound slope, said sections of the sloping surface of the bolster pocket merge along the length of said sloping surface of the bolster pocket and thereby form a recilinear crown, and each wedge comprises a pair of sections disposed in side-by-side relation in the associated bolster pocket, the sloping surface of each wedge section being in full face engagement with the opposed surface of the bolster pocket having a compound slope.

8. An assembly according to Claim 7, wherein the sloping surface of the bolster pocket is convex when viewed looking into the pocket, the rectilinear crown extending along the length of said sloping surface of the bolster pocket is disposed centrally between the opposed sidewalls of said pocket, and the sections of the sloping surface of the bolster pocket respectively on opposite sides of said crown are each flat across the width thereof.

9. An assembly according to any of Claims 3 to 6, wherein the sloping surface of the bolster pocket is deeper at the opposed sidewalls of the pocket than at

the centre thereof whereby the sections of said surface respectively adjacent said opposed sidewalls have a compound slope, said sections of the sloping surface of the bolster pocket merge along the length of said sloping surface of the bolster pocket and thereby form a crown, the sections of said sloping surface of the bolster pocket respectively on opposite sides of said crown are each flat across the width thereof, each wedge comprises a pair of sections disposed in side-by-side spaced relation in the associated bolster pocket, and one of said crown and the sloping surfaces of said wedge sections upon said sloping surface of the bolster pocket when said bolster member tilts to one side.

10. An assembly according to any of Claims 3 to 6, wherein the sloping surface of the bolster pocket is deeper at the opposed sidewalls of the pocket than at the centre thereof whereby the sections of said surface respectively adjacent said opposed sidewalls have a compound slope, said sections of the sloping surface of the bolster pocket merge along the length of said sloping surface of the bolster pocket and thereby form a curvilinear crown, and each wedge comprises a pair of sections disposed in side-by-side spaced relation in the associated bolster pocket, the sloping surface of each wedge section being the line contact with the associated section of the sloping surface of the bolster pocket.

11. An assembly according to Claim 10, wherein the sloping surface of the bolster pocket is convex when viewed looking into the pocket, the curvilinear crown extending along the length of said sloping surface of the bolster pocket is dispersed centrally between the opposed sidewalls of said pocket, and the sections of said sloping surface of the bolster pocket respectively on opposite sides of said crown are each flat across the width thereof.

12. An assembly according to any of Claims 3 to 6, wherein the sloping surface of the bolster pocket is deeper at the opposed sidewalls of the pocket than at the centre thereof whereby the sections of said surface respectively adjacent said opposed sidewalls have a compound slope, said sections of the sloping surface of the bolster pocket merge along the length of said sloping surface of the bolster pocket and thereby form a crown, the sections of said sloping surface of the bolster pocket respectively on opposite sides of said crown are each flat across the width thereof, each wedge comprises a pair of sections disposed in side-by-side spaced relation in the associated bolster pocket, and said wedge sections are urged into effective working position simultaneously by coil spring means seating upon one of said bolster and side frame members.

13. An assembly according to any of Claims 3 to 12, wherein the wedge angle is substantially less than 35 degrees.

14. An assembly according to Claim 13, wherein the wedge angle is approximately 30 degrees.

15. An assembly according to Claim 1, wherein the wedge accommodating pockets are formed in the columns of the side frame members, and the wedge members are secured respectively in said pockets against turning therein about a vertical axis and a selected horizontal axis.

16. An assembly according to Claim 15, wherein the sloping surface of the wedge accommodating pocket is deeper at the opposed sidewalls of the pocket than at the centre thereof whereby the sections of said surface respectively adjacent said opposed sidewalls have a compound slope, said sections of the sloping surface of the pocket merge along the length of said sloping surface of the pocket and thereby form a crown, the sections of said sloping surface of the pocket respectively on opposite sides of said crown are each flat across the width thereof, each wedge comprises a pair of sections disposed in side-by-side relation in the associated pocket, and one of said crown and the sloping surfaces of said wedge sections is curvilinear so as to allow rocking of said wedge sections upon said sloping surface of the pocket when said bolster member tilts to one side.

17. An assembly according to Claim 15, wherein the sloping surface of the wedge accommodating pocket is deeper at the opposed sidewalls of the pocket than at the centre thereof whereby the sections of said surface respectively adjacent said opposed sidewalls have a compound slope, said sections of the pocket merge along the length of said sloping surface of the pocket and thereby form a curvilinear crown, and each wedge comprises a pair of sections disposed in side-by-side spaced relation in the associated pocket, the sloping surface of each wedge section being in line contact with the associated section of the sloping surface of the pocket.

18. An assembly according to Claim 17, wherein the sloping surface of the wedge accommodating pocket is convex when viewed looking into the pocket, the curvilinear crown extending along the length of said sloping surface of the pocket is disposed centrally between the opposed sidewalls of said pocket, and the sections of said sloping surface of the pocket respectively on opposite sides of said crown are each flat across the width thereof.

19. An assembly according to Claim 15, wherein the sloping surface of the wedge accommodating pocket is deeper at the opposed sidewalls of the pocket than at the centre thereof whereby the sections of said surface respectively adjacent said opposed sidewalls have a compound slope, said sections of the sloping surface of the pocket merge along the length of said sloping surface of the pocket and thereby form a crown, the sections of said sloping surface of the pocket respectively on opposite sides of said crown are each flat across the width thereof, each wedge comprises a pair of sections disposed in side-by-side spaced relation in the associated pocket and said wedge sections are urged into effective working position simultaneously by coil spring means housed in said pocket and seated upon the bottom thereof.

20. In a freight car truck assembly,
(A) a pair of laterally spaced wheeled side frame members each provided with a bolster opening defined by means including a tension member, a compression member and a pair of laterally spaced column members with opposed vertically extending friction surfaces defining the width of said opening,
(B) a bolster member spanning said side frame

members and having opposite end portions respectively projecting into said bolster opening, the opposite side surface areas of each bolster and end portion respectively opposed to said friction surfaces being disposed respectively in close spaced relation thereto, said bolster being free, within limits, for turning in said openings relative to said side frame members under the influence of warp-inducing effort applied to said assembly, and being provided with open pockets respectively opposite said friction surfaces, each of said pockets having a sloping surface deeper at the opposed sidewalls of the pocket than at the centre thereof whereby the sections of said surface respectively adjacent said opposed sidewalls have a compound slope, and said sections of the sloping surface of the bolster pocket merge centrally along the length of the sloping surface of the bolster pocket and thereby form a curvilinear crown.

(C) a spring group interposed between each of said tensions members and the associated end portion of said bolster member which is operative to yieldably support said bolster member, and

(D) a wedge system at each of said side frame columns including:

(i) a wedge member slidably fitting into each bolster pocket and comprising a pair of sections disposed in side-by-side spaced relation, the sloping surface of each wedge section being in line contact with the associated section of the sloping surface of the bolster pocket, and

(ii) spring means reacting against the side frame and urging the sections of the wedge member into effective working position between the bolster and side frame members, the wedge members thereby being secured respectively in said pockets for turning movement with said bolster member, without lost motion, when the bolster member turns relative to said frame members under the influence of a warp inducing effort applied to said assembly.

21. In a freight car truck assembly,

(A) a pair of laterally spaced wheeled side frame members each provided with an opening therein defined by means including a tension member, a compression member and a pair of laterally spaced column members, the opposed faces respectively of said column members being provided with opposed open pockets each having a sloping surface deeper at the opposed sidewalls of the pocket than at the centre thereof whereby the sections of said surface respectively adjacent said sidewalls have a compound slope, and said sections of the sloping surface of the pocket merge centrally along the length of the sloping surface of the pocket and thereby form a curvilinear crown,

(B) a bolster member spanning said side frame members and disposed normally thereto with opposite end portions thereof projecting respectively into said openings, the opposite side surface areas of each bolster end portion respectively opposed to said column members being disposed respectively in close spaced relation thereto, said bolster member being free, within limits, for turning within said openings relative to said frame members under the influence of a warp-inducing effort applied to said

assembly,

(C) a spring group interposed between each of said tension members and the associated end portion of said bolster member which is operative to yieldably support said bolster member, and

(D) a wedge system at each of said frame columns including:

(i) a wedge member slidably fitting into each of said pockets and comprising a pair of sections disposed in side-by-side spaced relation, the sloping surface of each wedge section being in line contact with the associated section of the sloping surface of the side frame column pocket, and

(ii) spring means housed in said pockets and reacting against said side frame column to urge the sections of the wedge member into effective working position between the column and bolster members, the wedge members thereby being secured respectively against turning movement with said bolster member when said bolster turns relative to said side frame members under the influence of a warp-inducing effort applied to said assembly.

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